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Oil and Gas Developments in Pennsylvania in 1971

William S. Lytle

Louis Heyman

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
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by

William S. Lytle and Louis Heyman

ABSTRACT

Leasing and seismic activities in the Commonwealth in 1971 were at an all time high. An average of 3 seismic crews were continually busy in Pennsylvania during the year. Seismic surveys were made in 30 of the 67 counties in the Commonwealth. Oil and gas well drilling decreased from that of 1970 as well as oil and gas production. While oil reserves decreased gas reserves increased over those of 1970.

The total number of highlight wells increased from 65 reported in 1970 to 78 in 1971. The most active gas area was Indiana County with 99 new wells, down 20 wells from 1970. Again Venango and Warren Counties were the most active oil areas with 142 and 144 wells drilled respectively.

Pennsylvania Grade oil production amounted to 3,733,000 barrels while production of Corning Grade crude was 65,000 barrels or the same as in 1970. Shallow gas production increased 2 percent to 63,584 MMcf but deep gas decreased 15 percent to 12,867 MMcf. Gas storage capacity increased to 752,698 MMcf, and stored gas reserves increased 5 percent to 615,807 MMcf.

Other wells completed, including service, gas storage and old well workovers increased 18 percent in 1971. Total of all wells reported in 1971 was down by 33 wells, or 3 percent below 1970.

Of the 641 primary wells reported, 22 were exploratory and 619 development. This is a 46 percent decrease in exploratory wells and a 10 percent decrease in development wells from 1970. Exploratory completions were 18 percent successful and development completions 95 percent successful, a decrease of 69 percent and 4 percent respectively.

Exploratory footage was down 37 percent and development footage 13 percent from 1970. The average depth of all wells was 1845 feet, 146 feet shallower than in 1970.

Secondary and tertiary recovery projects remained active. The Maraflood pilot project in the Bradford field was expanded to 45 acres and the Goodwill Hill project of Warren County, covering 10 acres, is in operation. A third Maraflood in the Petroleum Center field, Venango County, is being developed. Several exhaust gas drive projects are operating in the Commonwealth.

Oil and gas base maps are now available for most of western Pennsylvania. Regional correlation sections of the surface to Middle Devonian and new oil and gas pipeline maps are now available. Tully to Queenston regional subsurface correlation sections will be available sometime during 1972.

INTRODUCTION

The generalized stratigraphic columns formerly presented in the annual oil and gas development reports have been superseded by Progress Report 178, *Representative Gamma-ray Logs from Shallow and Deep Wells, Western Pennsylvania.* This publication contains three shallow gamma-ray logs (two from the oil belt and one from the gas fields), and one deep gamma-ray log on which shallow and deep producing intervals have been designated.

Part I of this annual report draws attention to good completions in the Commonwealth in 1971 or wells of special note for other reasons. Part II contains the statistics and review of industry activities for the year, and Part III is the summarized records of 1971 deep wells.

ACKNOWLEDGMENTS

The writers acknowledge the cooperation of the Bradford District Producers Association, the Oil and Gas Division of the Bureau of Land Protection and Reclamation, the Division of Minerals of the Bureau of Forestry, and the Game Commission in the preparation of this report.

Appreciation is extended to operators and companies who released natural gas production statistics.

PART I. COMPLETION HIGHLIGHTS FOR 1971

SHALLOW HIGHLIGHTS

The lower limits of initial production used in considering a shallow well (Upper Devonian or younger) as a highlight well were established at 50 bopd or more and/or over 2 MMcfgpd (see PR 177, 1969).

There were 76 shallow highlight wells reported in 1971. This increase from the 62 reported in 1970 was primarily due to a substantial increase in Upper Devonian Zone B drilling activity. The highlight wells composed 7.7 percent of the total wells reported. Table 1 gives highlight well statistics.

Figure 1 shows the distribution of the highlight wells. The following is a brief description of those highlight occurrences about which information was released through the Oil and Gas Division of the Bureau of Land Protection and Reclamation.

Table 1. *Shallow highlight well statistics*

	1971			1970		
Fields with highlight wells	16			12		
Counties with highlight wells	10			7**		
	Wells			Wells		
Producing Zones	*Gas*	*Oil*	*Total*	*Gas*	*Oil*	*Total*
Pre-Speechley in Zone B*	7	4	11	8	3**	11**
Speechley or younger in Zone B*	0	58	58	0	45	45
Zone D*	0	7	7	0	6	6
Totals	7	69	76	8	54	62

* Zones of Upper Devonian rocks established in Progress Report 178
** Corrected figures

Pre-Speechley Gas Development

The pre-Speechley (Upper Devonian Zone B) development gas play in the west central part of the State continued to taper off during the year. One highlight well with a potential of 3 MMcfgpd was completed in the Salem Pool, Clearfield County, from this zone; 3 in Indiana County with potentials in MMcfgpd of 2.1 in the Marchand field, 2.3 in the Clarksburg field, and 5.0 in the Lewisville field; and 3 in Jefferson County with potentials in MMcfgpd of 2.0, 3.0, and 3.2, all in the Big Run Pool. No highlight gas wells from this zone were reported from other counties. A short summary on this pool is reported below.

Big Run Pool Highlights

Big Run Pool is located where Jefferson, Indiana, and Clearfield Counties meet. Structurally, the pool is situated on the southwestern plunge of Chestnut Ridge Anticline and produces from sandstones at depths of 2400 to 3200 feet. The producing sands occur in Units B1, B2, and B3 of Upper Devonian Zone B (see Wagner, 1969; Kelley and Wagner, in press). Unit B1 contains the Bradford Third and Kane sands, B2 the Tiona and Balltown sands, and B3 the Speechley sands. Commonly three or more sands are fractured through perforations and the initial open flow reported represents commingling of gas from the treated sands. Intense exploitation of the pool began in 1963 and has continued to the present. Statistics about the pool are given below:

Number of wells	300
Pool acreage	30,260 approx.
Greatest production year 1970	6,150,516 Mcf

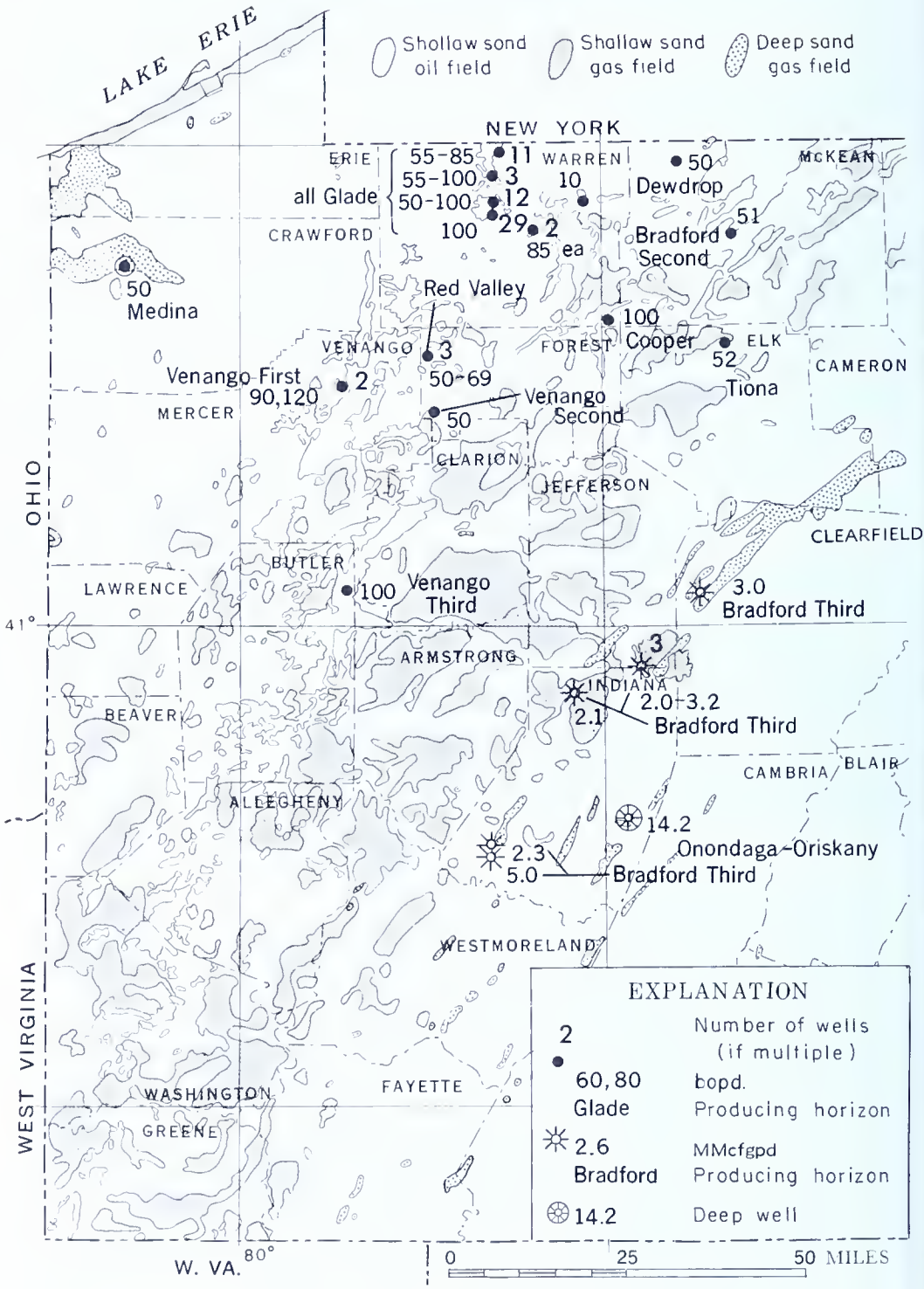


Figure 1. Highlight wells reported in 1971

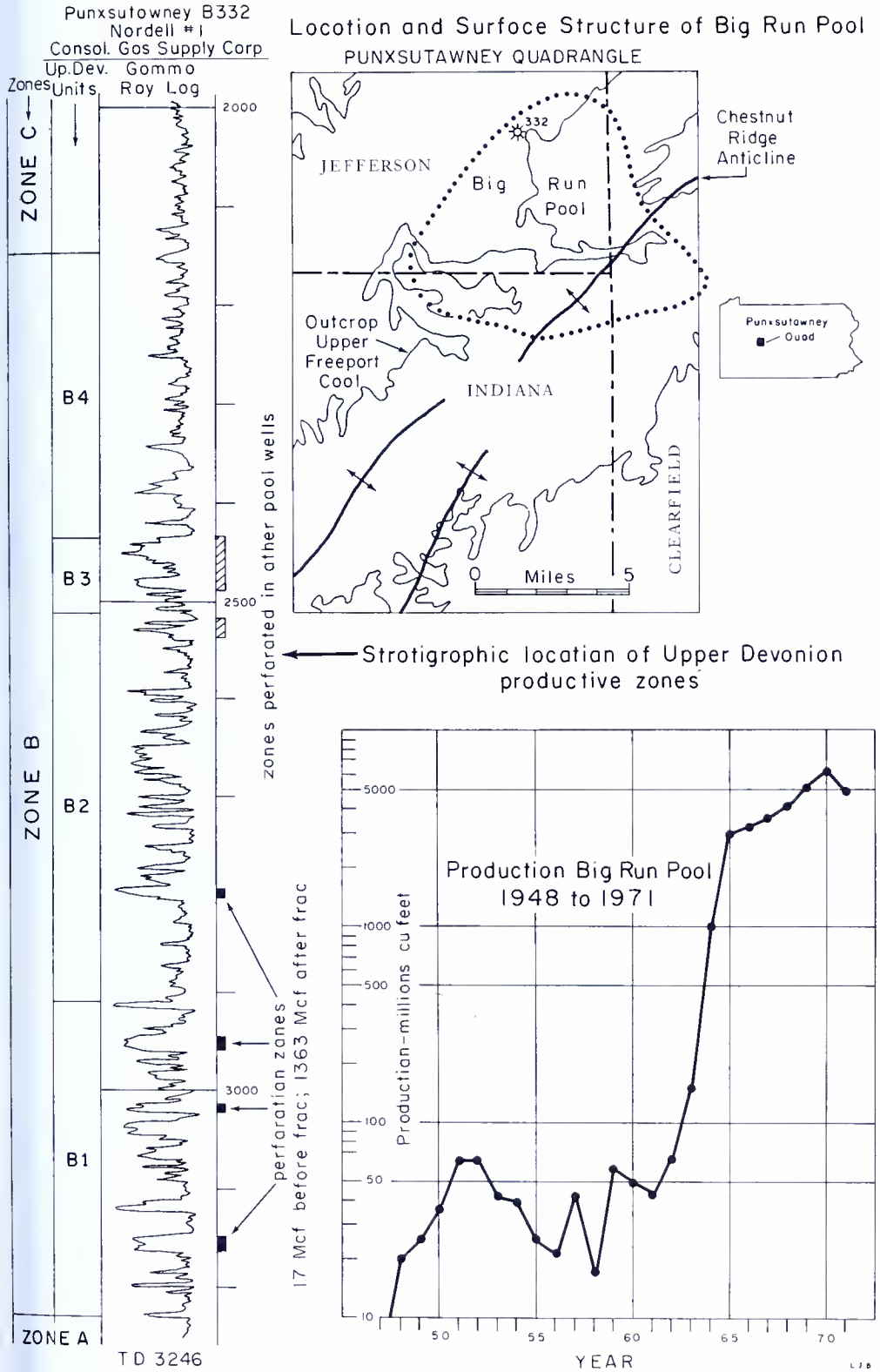


Figure 2. Big Run pool

Production 1971	4,871,429 Mcf
Cumulative production 1943-1971	32,150,044 Mcf
Average acres/well	approx. 100
Average production/well	approx. 107,000 Mcf
Yield/acre	approx. 1,063 Mcf

Venango Sandstone Oil Development, Butler, Forest and Venango Counties

Oil development in the Venango sandstone (Upper Devonian Zone D) fields in Butler, Forest, and Venango Counties continued at the 1970 pace. In Butler County, one highlight well was reported in the Parker field with a potential of 100 bopd from the Venango Third sandstone. In Forest County, three highlight wells in the White Church field had potentials of 50 to 69 bopd from the Red Valley sandstone and one well in the Indian Camp field had a potential of 50 bopd from the Venango Second sandstone. Venango County's two highlight wells had potentials of 90 and 120 bopd from the Venango First sandstone of the Oakland field.

Glade Sandstone Oil Development

The development of oil production from the Glade and related (Dewdrop) sandstones of Upper Devonian Zone B in Warren and McKean Counties decreased slightly in 1971 although the highlight wells increased to 59. Of the 58 in Warren County, 3 had potentials of 55 to 100 bopd in the Chandlers Valley field, 2 with potentials of 85 bopd in the Sill Run field, 11 with potentials of 55 to 85 bopd in the Sugar Grove field and 41 with potentials of 50 to over 100 bopd in the Youngsville field. The discovery well of the Hemlock Run pool had a potential of 108 bopd. In the Willow Creek-Cobb Hollow field, McKean County, a well had a potential of 50 bopd from the Dewdrop sandstone.

Pre-Speechley Oil Highlights

The pre-Speechley (Upper Devonian Zone B) had 3 highlight wells. In the Rasselas field of Elk County, a Tiona sandstone well had a potential of 52 bopd. A Bradford Second sandstone well with a potential of 50 bopd was drilled in the Lewis Run pool McKean County. In Warren County in the Cooper field, a Cooper sandstone well had a potential of 100 bopd.

DEEP HIGHLIGHTS

The lower limit for deep highlight wells is 10 MMcfgpd for a gas well and 50 bopd for an oil well (See PR 177, 1969).

A highlight well in Crawford County in the Indian Springs pool had potential of 50 bopd of Corning grade crude from the Medina sandstone, while in Indiana County a well producing from the Onondaga-Oriskany interval had a potential of 14.2 MMcfgpd in the Nolo pool.

PART II. OIL AND GAS INDUSTRY ACTIVITY FOR 1971

BASIS FOR STATISTICS

Local industry statistics herein reported are consistent with figures submitted to national industry organizations. Consequently, drilling and completion data are entirely based on driller's records and location plats forwarded to the Pennsylvania Geological Survey by the Oil and Gas Division of the Bureau of Land Protection and Reclamation of the Department of Environmental Resources, the administrative and regulatory agency for the Oil and Gas Laws. Only those wells for which records and plats have been received within the year are reported. This includes wells drilled in prior years for which records were submitted and received in 1971. It does not include 1971 wells completed for which records had not been submitted within the year.

Oil production and reserve data were obtained from the American Petroleum Institute, gas production and reserves data were obtained from the American Gas Association and data on county production and producing wells (Table 2) were obtained from the Pennsylvania Department of Commerce, Bureau of Statistics.

PREVIOUS COMPILATIONS

The deep well summarized records (those which reach rocks of Middle Devonian age or older) are shown in Table 15 and the locations of the deep exploratory wells are on Figure 3 (centerfold). For those deep wells drilled prior to 1950, the summarized records and other information on the Commonwealth's oil and gas activities are to be found in Bulletin M 31. Similar information for the 1950 to 1954 period was published in Bulletin M 39 and for the 1955 to 1959 period in Bulletin M 45. For the years 1960 through 1970 this information was published annually in Progress Reports 158, 160, 165, 166, 172, 173, 175, 177, 181, and 183 of the Pennsylvania Bureau of Topographic and Geologic Survey. Oil and gas developments in the shallow sands (Upper Devonian or younger) are described in Bulletin M 45 and Progress Reports 135, 139, 143, 144, 147, 150, 151, 154, 155, 157, 158, 160, 166, 168, 172, 173, 175, 177, 181, and 183.

Table 2. *Oil wells and crude oil in Pennsylvania by counties, 1970, 1971****

County	*1970 Crude oil production (bbls)*	*1971 Crude oil production (bbls)*	*Number of producing oil wells as of 12/31/70*	*Number of producing oil wells as of 12/31/71*
Allegheny	70,113	74,293	221	369
Armstrong	8,696	9,207	81	90
Beaver	7,202	6,657	65	61
Butler	105,600	95,306	1,634	1,521
Clarion	18,980	19,627	390	548
Crawford	72,235	68,274	656	566
Elk	31,791	30,407	66	74
Erie	138	106	29	29
Fayette	227	192	4	2
Forest	39,905	75,335	614	824
Greene	36,524	36,690	218	298
Jefferson	1,486	1,743	52	141
McKean	2,229,658	1,811,671	15,349	14,376
Mercer	886	780	85	95
Potter	16,335	16,008	185	189
Venango	311,121	870,765	12,122*	9,743
Warren	629,117	559,315	4,821	4,517
Washington	110,421	121,403	675	586
Total	3,690,435	3,797,779	37,267*	34,029

* Revised figure

** Compiled by the Department of Commerce, Bureau of Statistics

A list of deep-well samples on file with the Survey was published in the Survey's *Catalogue of Deep Well Samples and Geophysical Logs to January 1, 1959* (W. R. Wagner, IC 16). Supplemental lists were published in Progress Reports 157, 158, 160, 165, 166, 168, and 173. These and other deep and shallow well samples, geophysical logs, and other well data are also on file with the Survey. An inventory of all deep and shallow well samples has recently been completed by the Survey. It is available on request at cost of reproduction from the Survey's Pittsburgh office.

INDICATED STATUS OF LOCAL INDUSTRY

Oil well completions in 1971 decreased 10 percent, Pennsylvania grade oil production decreased 6 percent, and oil reserves decreased 7 percent to 47,103,000 barrels. Corning grade crude oil production remained the same at 65,000 barrels for the year, but reserves declined 15 percent to 383,000 barrels. No new crude oil reserves were found. Therefore, the production of oil continues to deplete the reserves.

Reserves of gas increased 1 percent while production declined 1 percent and completed gas wells declined 20 percent. The amount of gas in storage increased 5 percent over that of 1970.

Drilling and Completions

The breakdown of completions by county is shown in Table 3, and the old wells drilled deeper in Table 4.

Table 5 shows that drilling decreased during 1971 for shallow oil and gas and deep gas. During the year, exploratory and development drilling decreased 46 and 10 percent respectively from that of 1970 as shown in Table 6.

The total footage drilled in 1971 was down 13 percent with respect to the amount drilled in 1970 (see Table 7).

The 1971 reported discoveries are listed in Table 8 and more important dry exploratory tests reported are shown in Table 9. The locations of all of the exploratory tests are shown in Figure 3. On this figure are located two wells A and B in the Sanford field in Warren County. The wells are deeper pool tests that tested the Glade sandstone and were dry in that horizon. They were completed as development wells in the Venango group of sandstones. Figure 4 is a graph of the annual rate of shallow well activity in the Commonwealth from 1950 to 1971, while Figure 5 shows the annual rate of deep exploration and development from 1930 to 1971.

At the end of 1971, a total of 3,109 deep wells had been drilled since the beginning of exploration in the deeper horizons. Of the 3,109 deep wells, 1,687 were gas wells, 130 oil and gas wells, 1,082 dry holes, 206 gas storage wells, and 4 for waste disposal. The number of producing oil wells decreased from 37,267 in 1970 to 34,029 in 1971.

Production and Reserves

As shown in Table 10, oil production decreased and gas production decreased during the year. The portion of gas reserves stored increased 5 percent.

The 3,733,000 barrels of Pennsylvania grade crude had a value of $17,100,000. The 65,000 barrels of Corning grade crude oil were produced from the Medina Sandstone (Lower Silurian) in Crawford and Erie Counties. This oil had a value of $209,300.

For the first time, the Bradford District produced less oil than the rest of Pennsylvania (Table 11).

Figure 6 shows the annual production of crude oil in Pennsylvania from 1859 to 1971 and for the Bradford District from 1871 to 1971. The monthly variation in crude oil price, production, and well com-

Table 3. *Well completions in Pennsylvania, 1971**

County	TOTAL		GAS			OIL			DRY	
	No. of Wells	*Aver. Total Depth (feet)*	*No. of Wells*	*Aver. Init. Open-Flow (Mcfgpd)*	*Aver. Total Depth (feet)*	*No. of Wells*	*Aver. Init. Production (bopd)*	*Aver. Total Depth (feet)*	*No. of Wells*	*Aver. Total Depth (feet)*
Armstrong	18	3,626	17	741	3,443	0	0	0	1	6,726
Butler	1	1,322	0	0	0	1	100	1,322	0	0
Cameron	1	6,153	0	0	0	0	0	0	1	6,153
Cambria	2	8,824	1	2,000	8,535	0	0	0	1	9,113
Clarion	8	1,940	4	138	2,381	3	7	1,534	1	1,390
Clearfield	13	3,384	10	855	3,397	0	0	0	3	3,343
Crawford	14	3,260	9	1,055	4,109	1	1	749	4	1,977
Elk	8	2,057	1	842	2,800	7	11	1,951	0	0
Erie	3	3,349	3	1,533	3,349	0	0	0	0	0
Fayette	6	3,040	6	379	3,040	0	0	0	0	0
Forest	43	1,103	4	228	1,790	37	159	906	2	3,370
Fulton	1	2,870	0	0	0	0	0	0	1	2,870
Indiana	104	3,735	99	995	3,770	0	0	0	5	3,036
Jefferson	18	3,211	17	943	3,185	0	0	0	1	3,648
Lackawanna	1	4,233	0	0	0	0	0	0	1	4,233
McKean	52	1,797	3	28	2,643	48	6	1,675	1	5,085
Potter	5	2,413	0	0	0	4	9	1,373	1	6,572
Somerset	1	8,636	1	2,400	8,636	0	0	0	0	0
Venango	145	792	0	0	0	142	3	792	3	798
Warren	149	909	1	10	1,145	144	40	881	4	1,886
Westmoreland	6	3,403	5	1,050	3,495	0	0	0	1	2,944
Wyoming	2	2,900	1	5	1,721	0	0	0	1	4,078
TOTAL	601	1,883	182	901	3,572	387	19	979	32	3,206

* Does not include service wells, miscellaneous wells, stratigraphic/core tests or old wells drilled deeper.

Table 4. *Old wells drilled deeper in Pennsylvania, 1971*

County	TOTAL		GAS			OIL			DRY	
	No. of Wells	*Aver. Amt. Deepened (feet)*	*No. of Wells*	*Aver. Init. Open-Flow (Mcfgpd)*	*Aver. Amt. Deepened (feet)*	*No. of Wells*	*Aver. Init. Production (bopd)*	*Aver. Amt. Deepened (feet)*	*No. of Wells*	*Aver. Amt. Deepened (feet)*
Armstrong	7	564	4	301	499	0	0	0	3	651
Cambria	1	40	0	0	0	0	0	0	1	40
Elk	1	413	0	0	0	0	0	0	1	413
Forest	3	148	0	0	0	3	22	148	0	0
Indiana	19	537	13	758	709	0	0	0	6	163
Jefferson	2	961	1	393	1,816	0	0	0	1	105
Venango	1	252	0	0	0	0	0	0	1	252
Washington	4	684	1	60	166	0	0	0	3	856
Westmoreland	2	423	2	136	423	0	0	0	0	0
TOTAL	40	520	21	561	669	3	22	148	16	394

Table 5. *Drilling and Completions reported, 1971*

Classification		*1971*		*1970*		*% Change*
SHALLOW WELLS	New Wells	576		649		−11
	Gas	163		200		−18
	Oil	387		430		−10
	Dry		26		19	+37
	Deepened	39		43		− 9
	Gas	21		30		−30
	Oil	3		12		−75
	Dry		15*		1	+1400
	Sub Total	615		692		−11
	Gas	184		230		−20
	Oil	390		442		−12
	Dry		41		20	+105
DEEP WELLS	Gas	19		28		−32
	Dry		7**		5	+40
(NEW)	Sub Total	26		33		−21
PRIMARY SUB TOTAL		641		725		−12
	Gas	203		258		−21
	Oil	390		442		−12
	Dry		48		25	+92
Service (Gas & Water Injection Wells)		60		48		+25
Gas Storage Wells		80***		57		+40
Stratigraphic/Core tests		0		3		
Old Well Workovers		201		182		+10
Other Sub Total		341		290		+18
TOTAL ALL WELLS		982		1015		− 3

* Includes one exploratory old well drilled deeper
** Includes one deep well old well drilled deeper
*** Includes 48 old wells drilled deeper

pletions are plotted in Figure 7 for the years 1930 to 1971 for the Bradford District.

At the end of 1971 there were 16,586 producing gas wells in the Commonwealth. The 63,584,000 Mcf of shallow gas shown in Table 10 had a value of $17,167,680, while the 12,867,000 Mcf of deep gas had a value of $3,602,760. Figure 8 shows the following for the years 1946 to the present: (1) the yearly production of natural gas, (2) the yearly consumption of natural gas, (3) the natural gas reserves, and (4) the amount of natural gas in storage. The deep gas production by field and pool is shown in Table 12.

Table 6. *Exploratory and primary development reported, 1971*

Type Well	*1971*		*1970*		*% Change*
Exploratory	22		41		- 46
Gas	3		22		- 86
Oil	1		2		- 50
Dry	18*		17		+ 6
% Successful	18		58		- 69
Development	619		684		- 10
Gas	200**		236		- 15
Oil	389***		440		- 12
Dry	30****		8		+275
% Successful	95		99		- 4
TOTAL	641		725		- 12
Gas	203		258		- 21
Oil	390		442		- 12
Dry	48		25		+ 92
% Successful	93		96		- 3

* Includes 1 exploratory old well drilled deeper
** Includes 21 old wells drilled deeper
*** Includes 3 old wells drilled deeper
**** Includes 15 old wells drilled deeper

Table 7. Footage Reported, 1971 and 1970

Class	Footage 1971	Footage 1970	% Change	Average Ft. Per Well 1971	Average Ft. Per Well 1970
Exploratory	78,119	124,313	– 37	3,551	3,032
Development	1,074,398	1,232,506	– 13	1,736	1,802
Service & Stratigraphic	80,550	72,240	+ 12	1,343	1,416
Sub Total	1,233,067	1,429,059	– 14	1,759	1,842
Gas Storage	207,622*	229,700**	– 10	2,595	4,030
TOTAL	1,440,689	1,658,759	– 13	1,845	1,991

* Includes 48 old wells drilled deeper
** Includes 19 old wells drilled deeper

Gas Storage Fields

There were 32 new deep gas storage wells drilled during the year plus 48 drilled deeper, and several storage wells were worked over (Table 5). Storage well drilling activity was up 40 percent over that of 1970. Figure 9 in Progress Report 181 shows the distribution and lists the names of known gas storage fields in Pennsylvania. Changes since then were shown in Progress Report 183. Current changes are shown in Table 13.

Storage capacity increased during the year to 752,698,254 Mcf. The total gas in storage increased 5 percent to 615,807,000 Mcf of which 21,974,743 Mcf is native gas and 593,832,322 Mcf is stored gas.

Subsurface Disposal

The study on "Subsurface Liquid Waste Disposal and Its Feasibility in Pennsylvania" by Neilson Rudd, sponsored by the Pennsylvania Geological Survey, will be published by the end of 1972.

As of January 1, 1972 all subsurface disposal projects in Pennsylvania had been abandoned. The projects are listed in Progress Report 183 of the Pennsylvania Geological Survey. Approval has been given to Peoples Natural Gas Company to dispose of brine in the subsurface. The disposal well is located in Cambria County in the Rager Mountain natural gas storage field where it will be used to dispose of the small amount of brine that accumulates during withdrawal of gas in the

Table 8. *Reported Discoveries in Pennsylvania, 1971*

Map No.	*County*	*Operator Well No. & Lease*	*Compl. Date M-Day-Y*	*Total Depth (Ft.)*	*Name of Formation at T.D.*	*Prod. Depth (Ft.)*	*Prod. Form. or Zone*	*Initial Daily Prod.*	*Field or Pool Name*	*Explor. Class*	Remarks
14	Fayette	Zenith Exploration Co. 1 Martin O'Connor	4/ 7/71	3,081	Canadaway Group	3,012	Canadaway Group	336 Mcf	O'Connor Pool	SPD	Stratigraphic trap in Feik Field.
1	Warren	C. E. Lehmann 1 Johnson Estate	12/21/70	1,151	Glade	1,051	Glade	108 bopd	Hemlock Run Pool	NPD	Stratigraphic trap in Smith Corner's Field.

Table 9. *Selected Exploratory Failures Reported in Pennsylvania, 1971*

Map No.	*County*	*Operator Well No. & Lease*	*Compl. Date M-Day-Y*	*Total Depth (Ft.)*	*Name of Formation at T. D.*	*Explor. Class or Field*	*Remarks*
21	Armstrong	Peoples Natural Gas Co. 1 M. S. Wilson	9/30/71	6,726	Helderberg	DPW	Lower Devonian test limiting Snyderville Pool on the east.
20	Cameron	Sylvania Corp. 436 Kaul and Hall	9/10/71	6,153	Helderberg	NFW	Confirmed no Oriskany in area on NW flank of Sabinsville anticline.
10	Clearfield	Consolidated Gas Sup. Corp. 1 P. Rorabaugh	9/17/71	3,952	Kane	NFW	Upper Devonian test.
18	Crawford	R. McConnell 1 Floch-Roberts	8/15/71	4,440	Queenston	NFW	Oriskany and Medina test in NW Pennsylvania.
19	Forest	Roy A. Albaugh 1 A. W. Albaugh	8/15/70	4,720	Helderberg	DPW	Lower Devonian test; Oriskany absent.
5	Forest	DYM Corporation 1 M. Brecht	11/15/70	2,020	Speechley	NFW	Upper Devonian Speechley test.
22	Fulton	Consolidated Gas Sup. Corp. 1 G. W. Mellott	8/10/71	2,870	Helderberg	NFW	Lower Devonian test in highly folded Valley and Ridge province.
15	McKean	Pennzoil United, Inc. 1 Kewanee	5/ 8/71	5,085	Queenston	NFW	Silurian test, abnormally thin Helderberg and Keyser interval.
17	Potter	Texaco, Incorporated B-1 Pa. Dept. of For. & Wat.	8/28/69	6,572	Helderberg	NFW	Lower Devonian test on NW flank of Sabinsville anticline.
3	Wyoming	Columbia Gas Trans. Corp. 1 L. Spadine	10/14/71	4,078	Genesee	NFW	Upper Devonian test in NE Pennsylvania.

Table 10. *Production and reserves in Pennsylvania, 1971*

		Production				*Reserves*		
		1971	*1970*	*% Change*	*Cumulative to 12/31/71*	*1971*	*1970*	*% Change*
Oil (1,000 bbls.)	Penna. Grade	3,733	3,950	– 6	1,273,015	47,103	50,836	– 7
	Corning Grade	65	65	—	272	383	448	–15
	TOTAL OIL	3,798	4,015	– 5	1,273,287	47,486	51,284	– 7
	Natural Gas Liquids (1,000 bbls.)	79	78	+ 1	—	817	896	– 9
Gas (MMcf)	Shallow	63,584	62,321	+ 2	—	—	—	—
	Deep	12,867	15,214	–15	—	—	—	—
	TOTAL GAS	76,451	77,535	– 1	8,603,607	1,395,931*	1,377,502*	+ 1
* Portion Stored Gas						615,807	584,959	+ 5

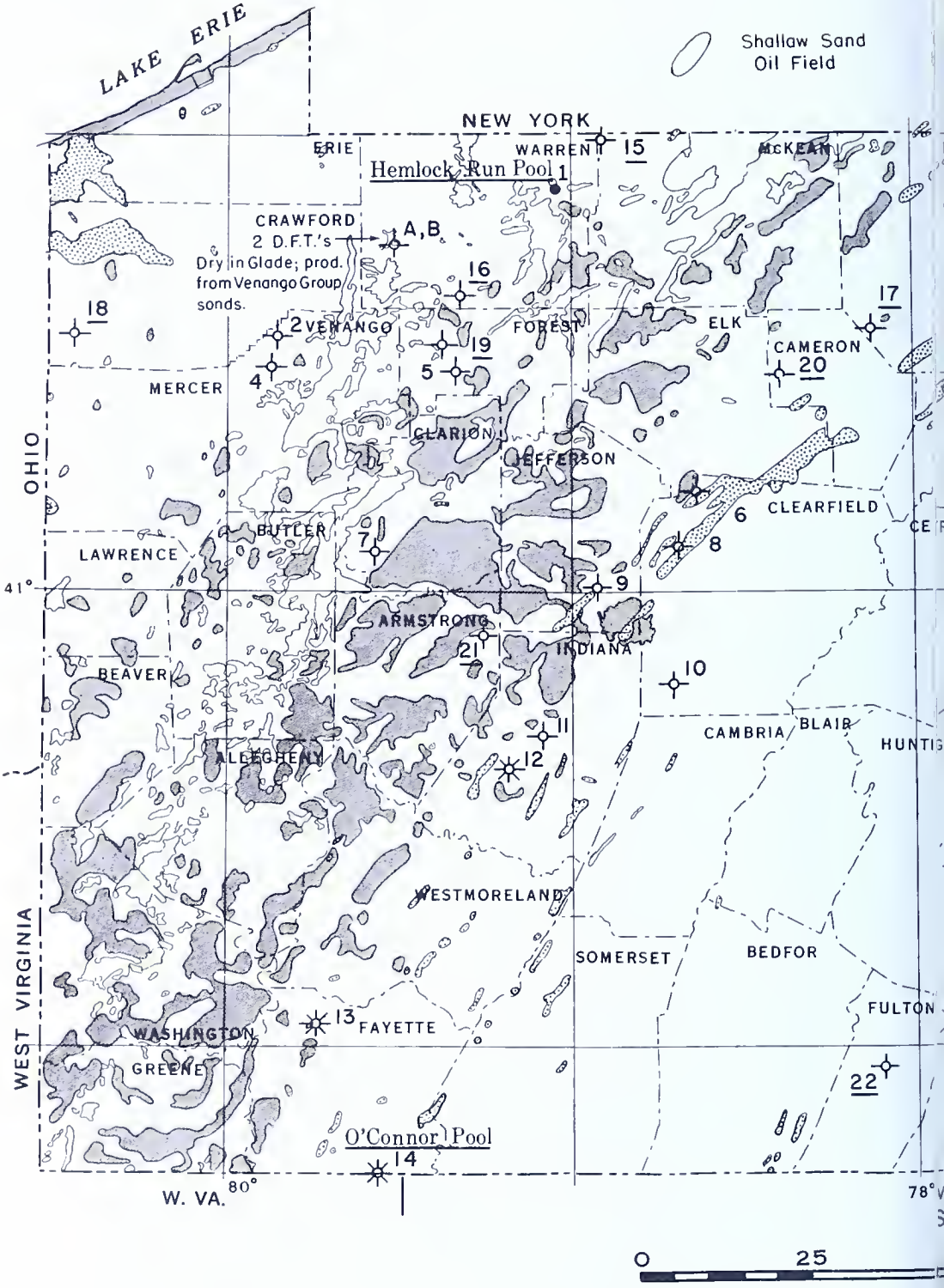
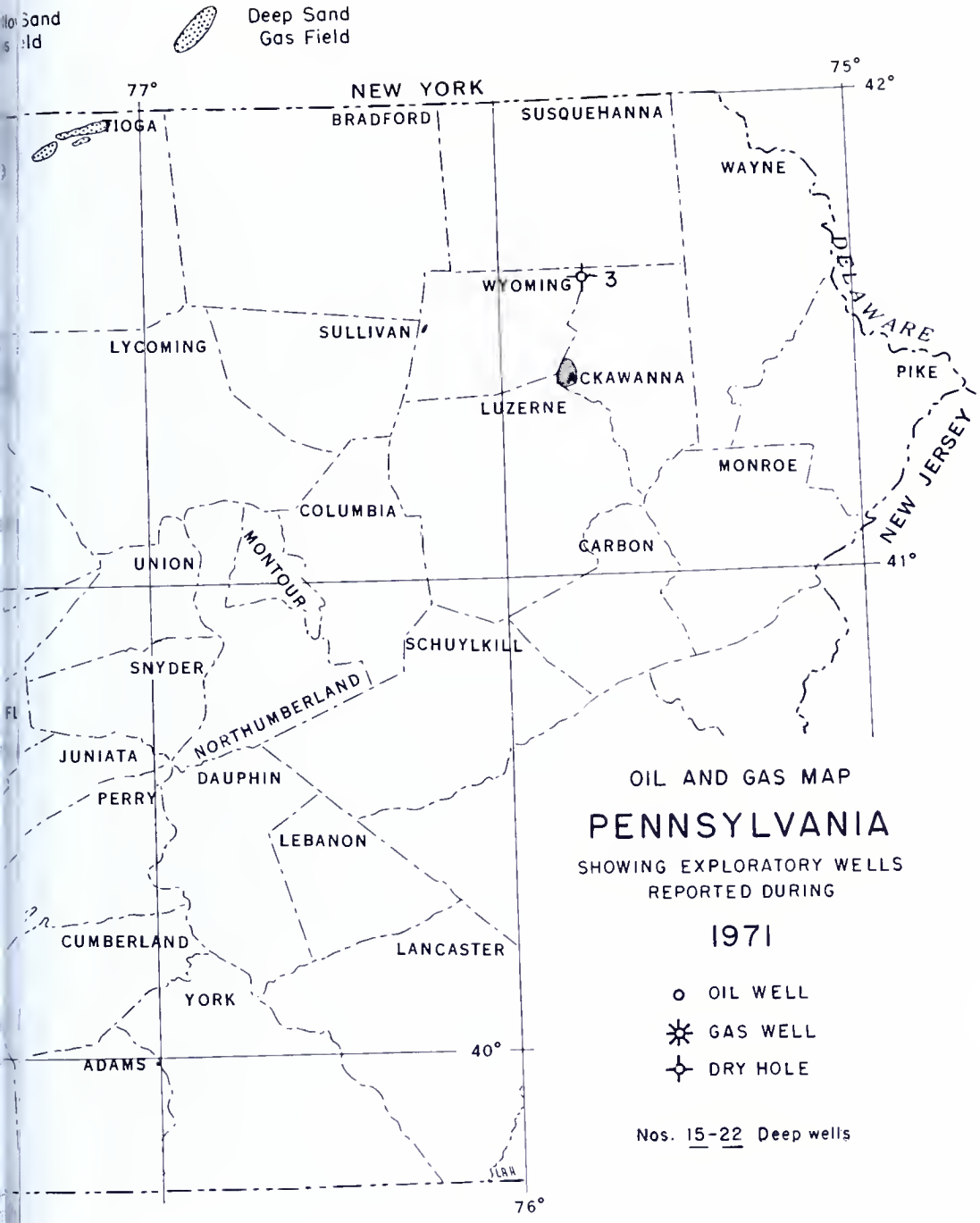


Figure 3. Oil and gas map of P



ing exploratory wells reported in 1971

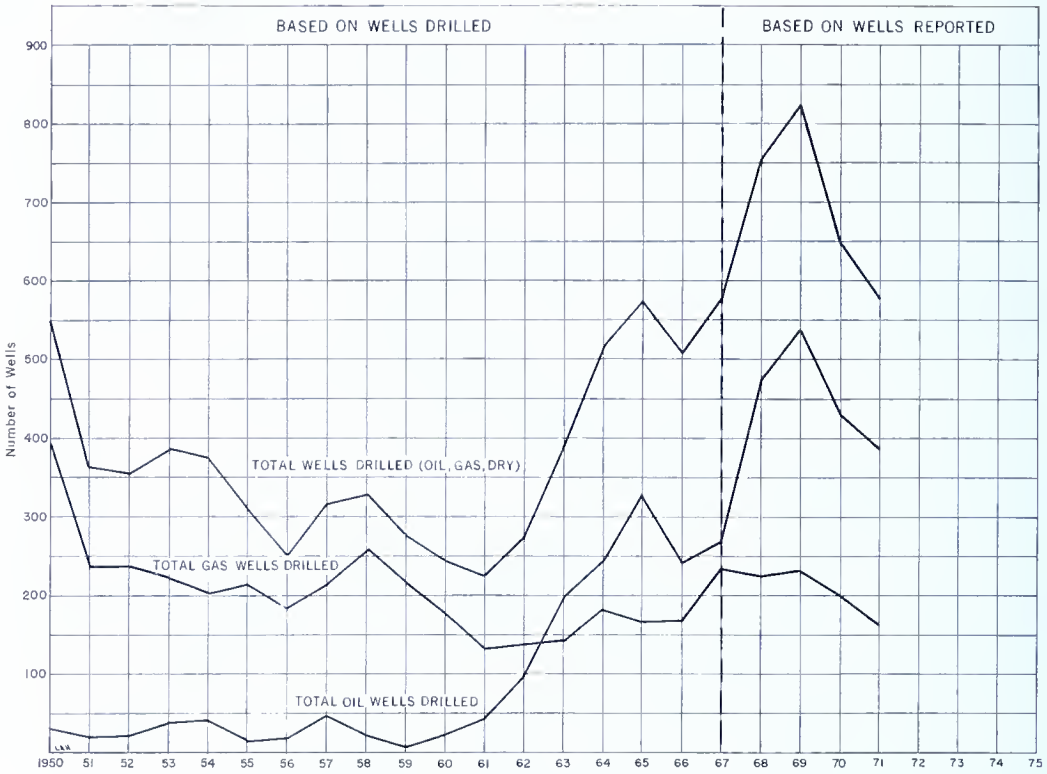


Figure 4. Shallow well activity, 1950-1971

winter months. The disposal horizon is the Murrysville sandstone of basal Mississippian age. Construction will be completed so that injection can take place in the fall of 1972 if necessary.

Secondary and Tertiary Oil Recovery Projects

There were 60 water or gas injection wells completed during the year, up 40 percent over 1970. In McKean County, 48 oil wells were completed, most of them within secondary recovery projects. These projects produced about 50 percent of the crude oil produced annually in Pennsylvania with 43 percent of the total produced coming from the waterfloods in McKean County.

Three exhaust gas drive projects are operating in the Commonwealth, and another one is under development. Oil production is not started until pressures in the producing formations are brought up to the original native rock pressures which are then maintained during the productive life of the project. The projects are operating in the Venango First and Second sandstones and the Glade sandstone. The operations are mostly entirely automated.

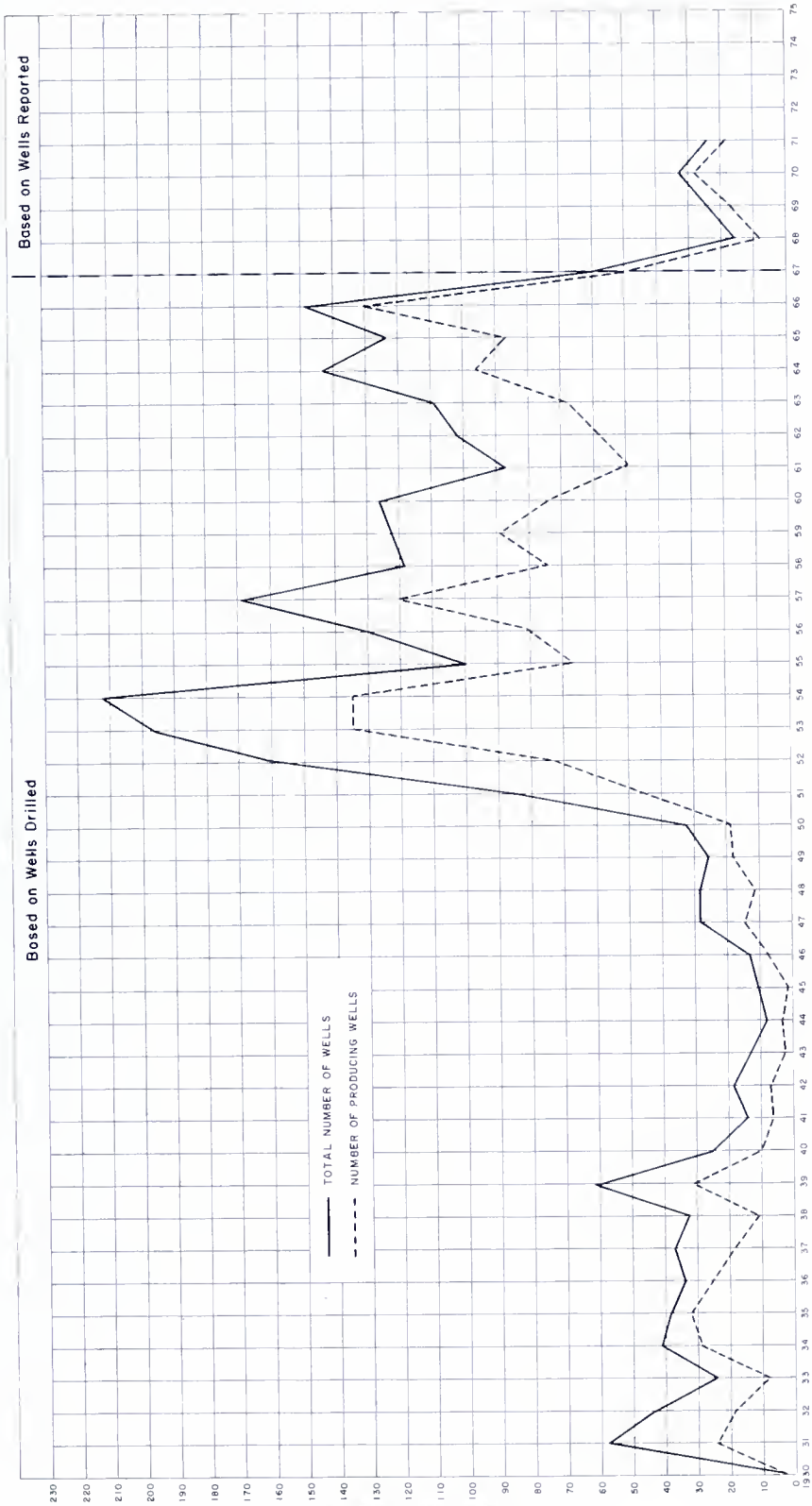


Figure 5. Deep exploration and development, 1930-1971

Table 11. *Average Daily Oil Production*

District	*1971*	*1970*	*% Change*
Bradford Field (Penna. portion only)	5,000	6,214	−20
Middle and Southwestern	5,222	4,605	+13
Medina Corning	178	178	—
TOTAL	10,400	10,997	−5

A total of three Maraflood projects are in some phase of development and operation in the Commonwealth. One of the pilot projects in a watered-out section of the Bradford field, McKean County, has been completed. The test was conducted in the oil-wet Bradford Third sandstone which contains a paraffinic crude and lies at a depth of about 1800 feet. The project was started in December, 1968 with a pattern size of 0.75 acre. The results of the pilot test were encouraging enough

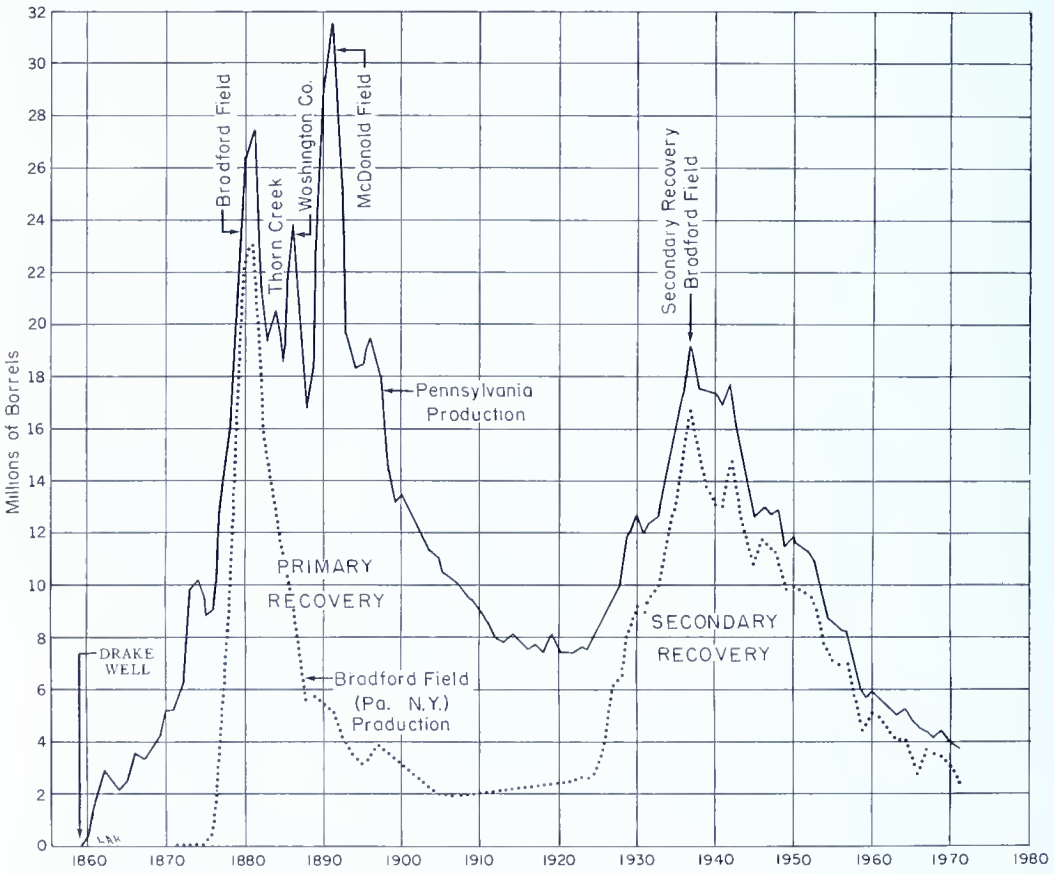


Figure 6. Annual production of crude oil in Pennsylvania

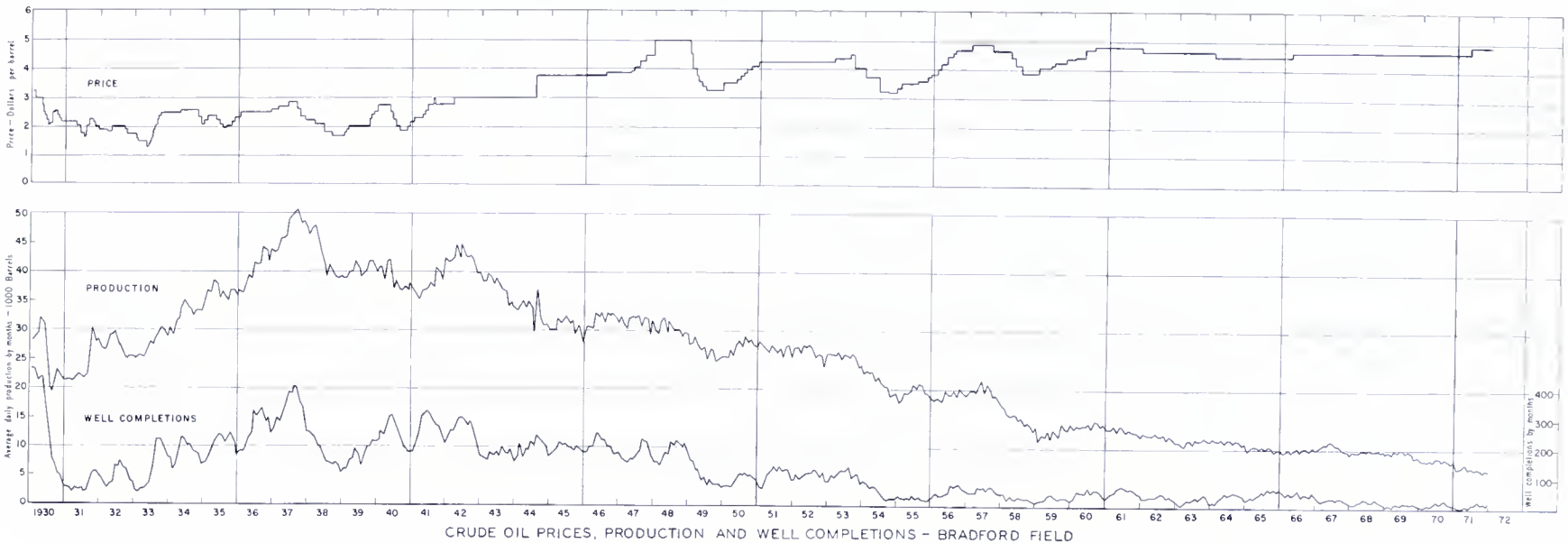


Figure 7. Crude oil prices, production and completions, Bradford District

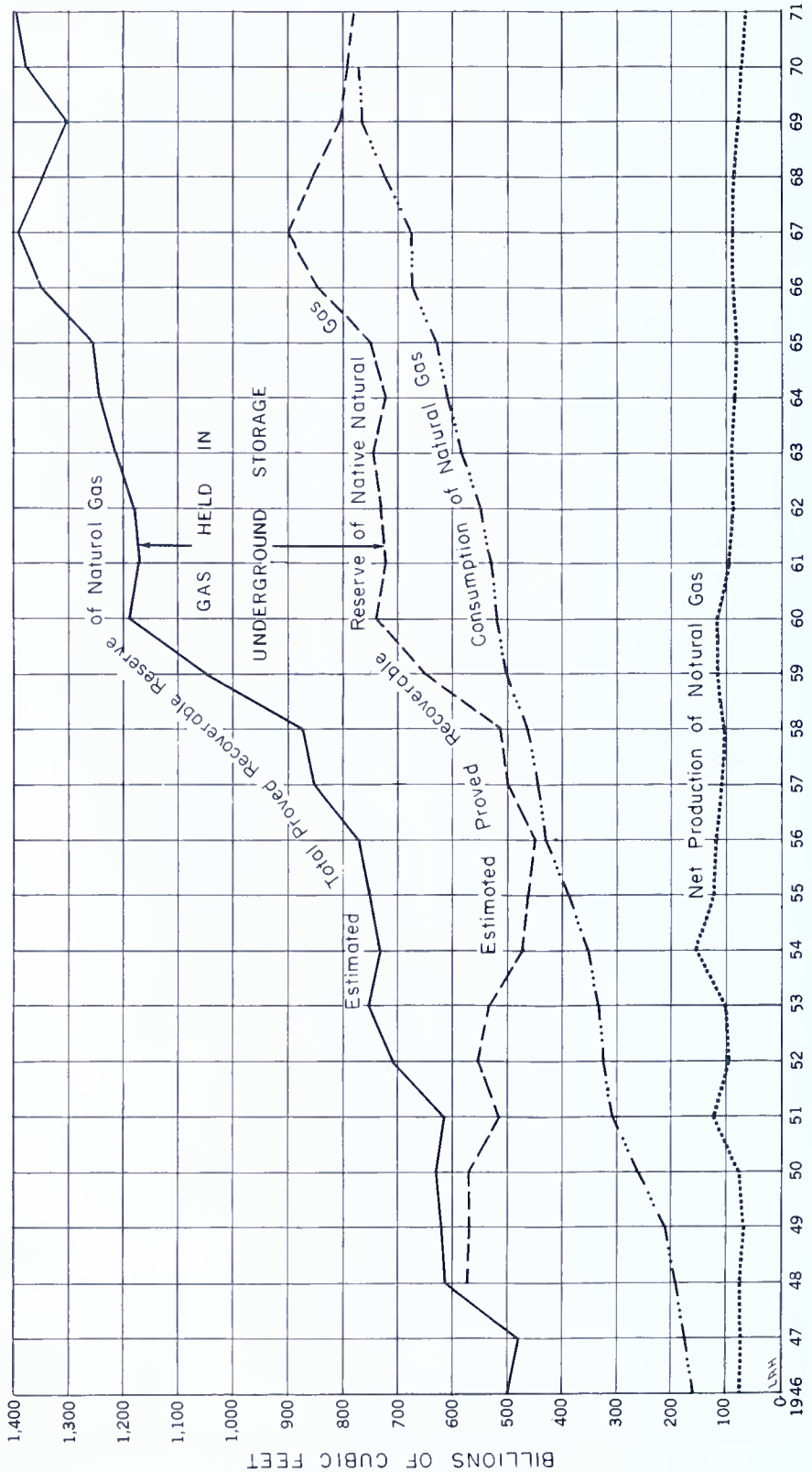


Figure 8. Production, consumption and reserves of natural gas in Pennsylvania

Table 12. *Deep-Gas Production in Pennsylvania, 1971*

County	*Field*	*Pool*	*Discovery Date*	*Cumulative Production at End of 1970 (In Mcf)*	*Production 1971 (In Mcf)*	*Cumulative Production at End of 1971 (In Mcf)*	*Status of Field or Pool at End of 1971*
Armstrong	Goheenville*	Snyderville	10/23/70		29,010	29,010	Producing
	Roaring Run*	Roaring Run					
		Oriskany	12/14/70		221,415	221,415	Producing
Bedford	Artemus	*TOTAL*	7/30/63	2,422,000	8,000	2,430,000	Producing
		Artemus	7/30/63	1,596,000	8,000	1,604,000	Producing
		Pennland	8/28/64	826,000		826,000	Producing
	Five Forks		6/21/62	14,889,000	144,000	15,033,000	Producing
	Purcell		12/14/57	3,098,000	19,000	3,117,000	Producing
Cambria	Patton	Burley	1/15/69				Shut-In
		Pindleton	6/30/69		189,112	189,112	Producing
	Rager Mt.		10/16/65	9,424,520	645,867	10,070,387	Gas Storage 6/71
Cameron & Elk	Whippoorwill		7/10/61	14,212,000	301,000	14,513,000	Producing
Cameron, Elk, Jefferson, Clearfield and Indiana	Punxsutawney*	*TOTAL*	9/15/51	469,682,000	3,245,000	472,927,000	Producing
	Driftwood	Benezette	1/ 5/53	242,331,000	1,142,000	243,473,000	Producing
		Driftwood	9/15/51				
		Boone Mt.	9/18/58	99,760,000	1,042,000	100,802,000	Producing
		DuBois	1/ 6/60				
		Sabula	8/26/63	802,000	26,000	828,000	Producing
		Helvetia	5/11/60	122,834,000	965,000	123,799,000	Producing
		Reed-Deemer	5/ 9/55 12/ 1/53				
		Rockton	2/25/55				
		Sykesville	11/10/60				
		Hicks Run	6/ 7/56	3,955,000	70,000	4,025,000	Producing
Clinton & Potter	Leidy	*TOTAL*	1/ 9/50	159,973,881	63,360	160,037,241	Gas Storage & Producing
		Ole Bull	1/ 9/59	5,173,849	63,360	5,237,209	Producing

Table 12. *(Continued)*

County	*Field*	*Pool*	*Discovery Date*	*Cumulative Production at End of 1970 (In Mcf)*	*Production 1971 (In Mcf)*	*Cumulative Production at End of 1971 (In Mcf)*	*Status of Field or Pool at End of 1971*
Crawford & Erie	Conneaut	*TOTAL*	2/11/57	26,389,730	1,998,924	28,388,654	Producing & Abandoned
		Bushnell-Lexington	12/31/58	12,456,022	740,596	13,196,618	Producing & Abandoned
		Indian Springs	9/11/57	9,319,352	880,297	10,199,649	Producing
		Kastle	7/14/62	2,262,768	244,148	2,506,916	Producing
		Lundys Lane	11/ 9/61	1,331,206	101,517	1,432,723	Producing
		Pierce	12/31/58	644,651	32,366	677,017	Producing
Erie	Burgess		10/17/60	137,482	4,093	141,575	Producing
	Corry	*TOTAL*	4/29/47	1,035,947	6,851	1,042,798	Gas Storage & Producing
		Beaver Dam	5/20/53	182,247	6,851	189,098	Producing
	Meade		8/23/46	4,918,188	2,919	4,921,107	Oriskany Gas Storage (One Producing Medina Well)
Fayette	Ohiopyle		12/28/59	3,725,429	52,537	3,777,966	Producing
	Sandy Creek*		8/ 8/63	440,286	53,805	494,091	Producing
		Fike	8/ 8/63	347,286	24,692	371,978	Producing
		Quebec Run	6/31/69	93,000	29,113	122,113	Producing
	Spruell		10/31/61	1,568,953**	392,074	1,961,027	Producing
	Summit	*TOTAL*	3/24/38	42,213,527	168,012	42,381,539	Producing & Abandoned
		North Summit	3/24/38	20,909,984	69,833	20,979,817	Producing
		South Summit	5/ 9/42	21,276,393	98,179	21,374,572	Producing
Indiana	Cherry Hill*	Crichton Hadden	1/ 9/63 7/11/63	2,611,589	72,806	2,684,395	Producing
	Jacksonville		9/21/56	27,458,633**	359,823	27,818,456	Producing
	Nolo		9/30/56	13,105,064**	93,953	13,199,017	Producing
	Strongstown	Pineton	12/20/69				Shut-In 1971
Jefferson	Big Run*	Elk Run	6/30/65	39,726,000	2,626,000	42,352,000	Producing
Mercer	Henderson	Kilgore	10/26/66				Production not available
	Wheatland		7/24/63	118,692	18,391	137,083	Producing

Potter	Ulysses	New Field	10/ 2/39 4/ 2/62	3,432,640	121,771	3,554,411	Producing
Somerset	Boswell	*TOTAL*	11/11/58	10,168,620	259,828	10,428,448	Producing
		Boswell	11/11/58	9,307,226	233,090	9,540,316	Producing
		Snyder	6/16/60	861,394	26,738	888,132	Producing
Warren	Sugar Grove	Pettigrew	5/29/70				Production not available
Washington	Daniels Run*	Glyde	9/ 6/61	81,295	5,916	87,211	Producing
	Belle Vernon	Lover	8/14/68	33,089			Plugged and Abandoned
Westmoreland	Blairsville*	Kahl	10/23/62	8,251,438	532,519	8,783,957	Producing
	Latrobe*	Dry Ridge	8/25/46	4,770,689	133,512	4,904,201	Producing
	Jacobs Creek*	Bailey	12/26/61	965,050	168,442	1,133,492	Producing
	Lycippus	*TOTAL*	8/17/49	5,942,634	97,203	6,039,837	Producing & Abandoned
		St. Boniface Chapel	9/13/56	5,203,206	97,203	5,300,409	Producing
	Murrysville*	*TOTAL*	11/ 3/1878	421,854	49,450	471,304	Producing & Abandoned
		Duquesne	8/ 8/65	297,961	49,450	347,411	Producing
Westmoreland & Somerset	Johnstown	*TOTAL*	5/16/57	22,342,850	717,032	23,059,882	Producing & Abandoned
		Baldwin	5/22/60	7,691,699	289,848	7,981,547	Producing & Abandoned
		Beck	5/16/57				
		Williams	2/14/58	14,651,151	427,184	15,078,335	Producing
	Seven Springs	*TOTAL*	12/15/58	7,104,943	316,166	7,421,109	Producing & Abandoned
		Blair Tunnel	12/ 5/58 3/10/65	5,898,275	282,288	6,181,563	Producing
		Seven Springs	8/ 3/66	483,245	33,878	527,123	Producing

* "Shallow" gas production of field not shown

** Corrected figures

Table 13. *Changes in Gas Storage Fields*

County	Name of Storage Field or Pool	Disposition
Cambria	Rager Mountain	New Storage Field 1971
Clinton	Tamarack	New Storage Pool 1971
Greene	Kerby	Abandoned as gas storage

to warrant the expansion of the pilot into a 45-acre project consisting of 16 injection wells and 25 producers. The expansion started in January, 1971, and operations are continuing.

A second Maraflood project was started in May, 1971 in the water-wet First Venango sandstone at a depth of about 500 feet below the surface. This project is in the Goodwill Hill area of Warren County. It consists of four one-acre five spots with nine injection wells, four inside producers, and eight outside producers, covering a total of 10 acres. The First Venango sandstone in this area had been gas driven but never waterflooded. The crude oil in the reservoir is also paraffinic. Operations in the project are continuing.

A third project is in the development stage in Venango County, in the Petroleum Center field. The reservoir sandstone is the Venango Second.

Oil and Gas Prices

Crude oil prices during the year are shown in Table 14. The wellhead price for intrastate natural gas in contracts made prior to 1971 generally averaged between 27 and 32 cents per Mcf. New contract prices range from 38 to 40 cents per Mcf. Interstate gas contracts prior to 10/8/69 were for 30.75 cents per Mcf, while contracts after 10/7/69 were for 32.75 cents per Mcf.

Table 14. *Crude Oil Prices Per Barrel, Pennsylvania 1971*

	Pennsylvania Grade Crude		
Date	*Bradford District*	*Middle District*	*Southwestern District*
Jan. 1 to April 30, 1971	$4.63	$4.35	$3.92
May 1 to Dec. 31, 1971	$4.88	$4.60	$4.17
	Corning Grade Crude		
Jan. 1 to Dec. 31, 1971	$3.22 Erie and Crawford Counties		

Land Sales

During the year a total of 2,778 acres were leased to bidders by the Pennsylvania Game Commission in Pike County. The bonus bid was $21,588.17 with a rental of $1.00 per acre and a royalty of $.04 per Mcf. At the end of 1971, the Commission had 28 active leases totaling 14,680.9 acres. Thirty-six wells were producing on the 28 leases. No wells were drilled on the leases during 1971.

Through competitive bidding, State Forest or Park lands comprising 3,840 acres in Bedford County, 5,022 acres in Cameron County, 7,542 acres in Pike County, 12,598 acres in Potter County, and 1,931 acres in Cameron and Potter Counties were leased during 1971. The total bonus or first-year rental received for these tracts was $230,075.33. The average of all sales was $7.43 per acre. After the first year, the rental is $1.00 per acre per year with royalties equal to 1/8 or better of all production.

The income relative to oil and gas exploration and development from State Forest and Park lands resulted in a total income of $538,369.97, of which royalty payments amounted to $139,658.18 for 1,407,463 Mcf of gas produced on the lands and $398,711.79 for tract rentals, gas storage, right of ways, etc.

At years end, there were 157,085 acres (59,109 acres of gas storage included) of State Forest and Park lands under lease for oil and gas exploration and development.

Geophysical Activity

Seismic activity was at an all time high during the year, most of it Vibroseis. Seismic crews logged 147 crew-weeks during 1971 compared with 45 crew-weeks during 1970, an increase of 227%. Seismic surveys were made in 30 of the 67 counties in the Commonwealth: Bedford, Blair, Bradford, Cambria, Cameron, Centre, Clearfield, Clinton, Crawford, Elk, Erie, Forest, Fulton, Greene, Indiana, Jefferson, Lackawanna, Lawrence, Lycoming, McKean, Mercer, Pike, Potter, Susquehanna, Tioga, Venango, Warren, Washington, Wayne, and Wyoming Counties.

INDUSTRY RELATED ACTIVITIES

Subsurface data is available from the Survey in connection with current projects. The progress made on pertinent Survey projects is outlined below.

Subsurface Base Maps

Paper prints of the well location base maps with superimposed field outlines are available. Each base (scale 1: 62,500) comprises the area of four 15 minute topographic quadrangles and locates all post-Oil and Gas Law shallow wells and all deep wells of record, as described in

Progress Report 177. Figure 9 indexes available base maps. Numbers 34, 35, and 36 are new as of July 1, 1972. Numbers 16, 17, 18, 19, 21, 22, 23, 24, 25, 26, 28, 29, 30, 31, 32, and 33 have been updated (posted date July 1, 1972). Orders for these maps are to be sent to the Pennsylvania Bureau of Publications, P. O. Box 1365, Harrisburg, Pennsylvania 17125. The cost of each map is $0.50, plus 6 percent state sales tax to Pennsylvania residents. A check for the appropriate total amount made out to the Commonwealth of Pennsylvania must accompany the order. When ordering, please specify the map number.

Designation	*Quadrangles Encompassed by Mapped Areas*
Map 16	Corry, Tidioute, Titusville, Youngsville
Map 17	Kane, Kinzua, Sheffield, Warren
Map 18	Clarion, Foxburg, Oil City, Tionesta
Map 19	Brookville, DuBois, Hallton, Marienville
Map 21	Butler, New Kensington, Sewickley, Zelienople
Map 22	Elders Ridge, Freeport, Kittanning, Rural Valley
Map 23	Barnesboro, Indiana, Punxsutawney, Smicksburg
Map 24	Connellsville, Donegal, Greensburg, Latrobe
Map 25	Amity, Brownsville, Carnegie, Pittsburgh
Map 26	Franklin, Hilliards, Mercer, Stoneboro
Map 28	Neshannock, Shenango, plus Kinsman and Youngstown in Pennsylvania
Map 29	Beaver, New Castle, plus Columbiana and Wellsville in Pennyslvania
Map 30	Burgettstown, Claysville, plus Steubenville and Wheeling in Pennsylvania
Map 31	Rogersville, plus Cameron and Mannington in Pennsylvania
Map 32	Masontown, Waynesburg, plus Blacksville and Morgantown in Pennsylvania
Map 33	Johnstown, New Florence, Somerset, Windber
Map 34	Confluence, Uniontown, plus Accident and Bruceton in Pennsylvania
Map 35	Berlin, Meyersdale, plus Grantsville and Frostburg in Pennsylvania
Map 36	Conrad, Coudersport, Emporium, Genesee

Regional Correlation Sections

The surface to Middle Devonian correlation sections reported in Progress Report 183 have been completed. The sections and accompanying

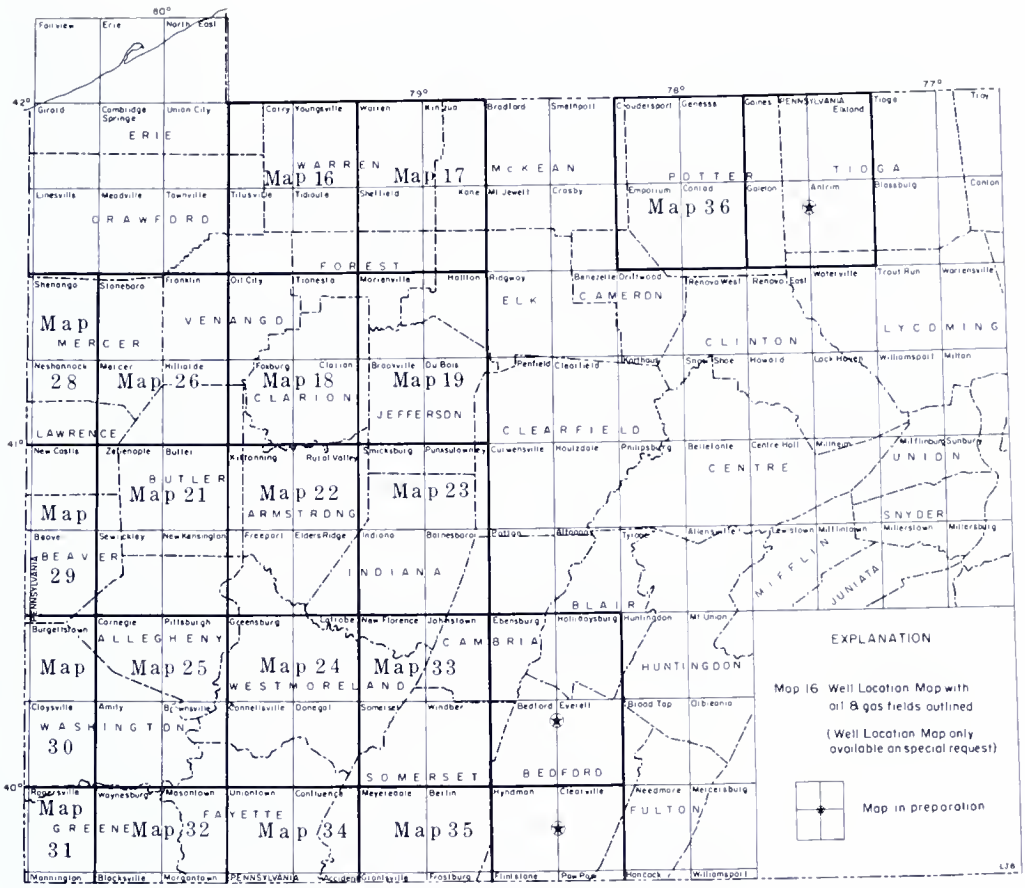


Figure 9. Index of available subsurface base maps

text are on open file in the Survey office. Copies may be obtained from the Survey at the cost of duplication.

Tully (Middle Devonian) to Queenston Regional Subsurface Correlation Sections by Louis Heyman is an open-file report in preparation. The publication will contain eight geophysical log cross sections (vertical scale 1: 100), a location map and a short text. The sections extend across most of northern and western Pennsylvania. The cross sections divide the stratigraphic column from the top of the Middle Devonian to the base of the Silurian into major operational geophysical units which can be followed over large areas of the Commonwealth. Also noted are identifiable salt zones and reported shows of oil, gas and water. When these sections are complete they will be on open file at the Survey. Copies will be obtainable from the Survey in the same manner as the surface to Middle Devonian correlation sections mentioned above.

Pipeline Maps

The Principal Crude Oil and Product Pipelines Map of Pennsylvania and Principal Natural Gas Pipelines Map of Pennsylvania have been brought up to date as of January 1, 1972, and placed on open file. These maps are available from the Survey at the cost of reproduction.

Pool Unitization and Integration

At hearings held on January 13, 1971 the following applications by Kewanee Oil Company were approved concerning the northern end of the Burley Pool unit in Cambria County: 1) to modify Spacing Order No. 8 by adding 640 acres, known as Westrick A Unit, to the area and approve it for a drilling unit, 2) to integrate the working interests in a unit known as the Westrick Unit.

PART III. SUMMARIZED RECORDS OF DEEP WELLS REPORTED IN 1971

The information in the following tables has been compiled mainly from drillers' logs and location plats received from the Oil and Gas Division of the Bureau of Land Protection and Reclamation. Other sources are Petroleum Information Corporation (PI), geophysical logs received by the Pennsylvania Geological Survey and personal communications with oil and gas operators. The identification numbers in Table 15 refer only to well location numbers on Figure 3 of this report. The more significant numbers are the permit numbers by which the wells are filed with the Bureau of Land Protection and Reclamation and the unique quadrangle numbers by which the Survey files the wells and locates them on 15 minute quadrangle maps.

An asterisk preceding a certain depth figure indicates that the indicated formation top or total depth has been picked from a geophysical log. A depth figure without asterisk means that the formation top or total depth is from the drillers' log or PI. These tables are listed alphabetically by county and by name of well.

Table 13. Summarized record of deep wells reported in 1971

MAP NUMBER			21					20			
COUNTY Permit Number		Armstrong 1365	Armstrong 1354	Beaver 23	Cambria 29	Cambria 28	Cambria 25	Cameron 34	Clinton 120	Clinton 115	Clinton 140
NAME OF WELL		ASCS Unit #1	M. S. Wilson #1-4689	R. Rhodes #C-1	J. Fenchak #1-4690	M. E. Jervis #1-4669	G. I. Reade #2-4676	Kaul & Hall #1-436	Con. Gas Supply #LW-805	F. E. Gardner #LW-632	W. E. Joseph #LW-629
OPERATOR		Pennzoil United	Peoples Natural Gas Co.	Columbia Gas of Penna.	Peoples Natural Gas Co.	Peoples Natural Gas Co.	Peoples Natural Gas Co.	Sylvania Corp.	Consol. Gas Supply Corp.	Consol. Gas Supply Corp.	Consol. Gas Supply Corp.
TOWNSHIP		Kiskiminetas	Wayne	South Beaver	Cambria	Cambria	Jackson	Shippen	Leidy	Leidy	Leidy
QUADRANGLE		Elders Ridge D 43	Rural Valley F 5	New Castle G 11	Barnesboro I 28	Barnesboro I 27	Johnstown A 14	Benezette B 300	Renovo West C 214	Renovo West B 213	Renovo West C 223
LATITUDE		20,100 ft. S 40°40'	5,950 ft. S 40°55'	29,800 ft. S 40°50'	17,250 ft. S 40°35'	19,950 ft. S 45°35'	29,850 ft. S 40°30'	6,400 ft. S 41°30'	11,700 ft. S 41°30'	21,150 ft. S 41°30'	27,600 ft. S 41°30'
LONGITUDE		14,800 ft. W 79°25'	4,700 ft. W 79°15'	9,000 ft. W 80°25'	7,500 ft. W 78°45'	11,150 ft. W 78°45'	5,850 ft. W 78°50'	17,350 ft. W 78°20'	16,150 ft. W 77°45'	8,050 ft. W 77°50'	22,350 ft. W 77°45'
DATE COMPLETED		9-11-71	10-2-71	6-16-70	12-12-71	11-16-71	4-21-71	9-13-71	8-23-71	8-17-71	10-17-71
ELEVATION		1515 KB	1402 GL	1043 KB	2320 KB	2247 KB	2493	1261 KB	1673	1657	1752
TULLY		☆6752-6878	6018-6126	☆4298-4308	☆7719-7746	☆7466-7488	☆6956-6978	☆5200-5274	5525-	5676-	6033-
ONONDAGA	LIMESTONE	☆7294-7299	☆6505-6523	☆4457-4469	☆8802-8840	☆8349-8366	☆7716-7734	☆5962-5992	6404-6431	6467-6484	6483-6861
	CHERT	☆7299-7442	☆6523-6626	☆4469-4661	☆8840-9012	☆8366-8454	☆7734-7828	☆5992-6042			
ORISKANY		☆7442-7458	Absent	☆4661-4726	☆9012-9050	☆8454-8474	☆7828-7860	Absent	6431-6464	6484-6516	6861-6906
HELDERBERG		☆7458-	☆6626-6701	☆4726-	☆9050-	☆8474-	☆7860-	☆6042-6096	6464-	6516-	6906-
KEYSER-BASS ISLANDS SALINA			☆6701-					☆6096-			
GUELPH-LOCKPORT BLACK WATER											
CLINTON IRONDEQUOIT											
MEDINA											
QUEENSTON											
TOTAL DEPTH		☆7487	☆6720	☆4755	☆9098	☆8520	☆7921	☆6150	6610	6610	6975
DEEPEST FORMATION REACHED		Helderberg	Keyser	Helderberg	Helderberg	Helderberg	Helderberg	Keyser	Helderberg	Helderberg	Helderberg
RESULT		0 Mcf Nat. 2,600 Mcf AF 3,925 psi/48 hrs Roaring Run Pool	44.7 Mcf Nat. 0 psi/48 hrs. Abandoned McCrea Furnace Deeper Pool Test	No test, SW in Oriskany Gas Storage South Beaver Pool	36.5 Mcf AF Abandoned Pindleton Pool	2,000 Mcf AF 3,725 psi/5 days Pindleton Pool	500 Mcf Nat. 5,370 Mcf AF 2,100 psi/72 hrs. Gas Storage Rager Mountain Pool	NSOG Abandoned Wildcat	415 Mcf Nat. 415 Mcf AF 3,150 psi/48 hrs. Gas Storage Leidy Pool	8,934 Mcf Nat. 21,852 Mcf AF 3,540 psi/48 hrs. Gas Storage Leidy Pool	75 Cf Nat. 426 Cf AF 13 psi/48 hrs. Gas Storage Tamarack Pool

Table 15. *(continued)*

MAP NUMBER										
COUNTY Permit Number	Clinton 129	Clinton 117	Clinton 142	Clinton 83	Clinton 130	Clinton 144	Clinton 114	Clinton 112	Clinton 106	Clinton 105
NAME OF WELL	L. S. Kunkel #1 #LW-631	Pa. Dept. F & W Tract "A" #LW-515	Pa. Dept. F & W Tract "C" #LW-630	Pa. Dept. F & W Tract 6 #11 #LW-513	Pa. Dept. F & W Tract 6 #LW-516	Pa. Dept. F & W Tract 6 #LW-520	Pa. Dept. F & W Tract 6 #LW-400	Pa. Dept. F & W Tract 6 #LW-517	Pa. Dept. F & W Tract 15 #14 #RW-36	Pa. Dept. F & W Tract 15 #13 #RW-22
OPERATOR	Consol. Gas Supply Corp.	Consol. Gas Supply Corp.	Consol. Gas Supply Corp.	Consol. Gas Supply Corp.	Consol. Gas Supply Corp.	Consol. Gas Supply Corp.	Consol. Gas Supply Corp.	Consol. Gas Supply Corp.	Consol. Gas Supply Corp.	Consol. Gas Supply Corp.
TOWNSHIP	Leidy	Leidy	Leidy	Leidy	Leidy	Leidy	Leidy	Leidy	Chapman	Leidy
QUADRANGLE	Renovo West B 212	Renovo West E 219	Renovo West C 222	Renovo West B 224	Renovo West E 221	Renovo West B 209	Renovo West B 210	Renovo West B 211	Renovo West C 208	Renovo West C 207
LATITUDE	19,200 ft. S 41°30'	4,200 ft. S 41°25'	27,400 ft. S 41°30'	29,300 ft. S 41°30'	2,800 ft. S 41°25'	25,750 ft. S 41°30'	28,000 ft. S 41°30'	22,100 ft. S 41°30'	13,850 ft. S 41°30'	16,100 ft. S 41°30'
LONGITUDE	4,600 ft. W 77°50'	4,550 ft. W 77°50'	19,200 ft. W 77°45'	13,100 ft. W 77°50'	3,600 ft. W 77°50'	14,850 ft. W 77°50'	15,900 ft. W 77°50'	11,600 ft. W 77°50'	2,450 ft. W 77°45'	4,650 ft. W 77°45'
DATE COMPLETED	8-22-71	10-18-71	10-9-71	5-5-71	9-28-71	8-25-71	8-22-71	8-24-71	5-28-71	5-26-71
ELEVATION	1734	1993	1853	1615	1878	1482	1656	1656	1682	1698
TULLY	5750-	6312-	6132-	5452-	6135-	5500-	5575-	5799-	5809-	5888-
ONONDAGA LIMESTONE CHERT	6539-6558	7140-7159	6949-6968	6260-6279	6940-6961	6275-6292	6351-6370	6588-6608	6644-6662	6722-6742
ORISKANY	6558-6584	7159-7206	6968-7012	6279-6303	6961-7004	6292-6320	6370-6390	6608-6639	6662-6704	6742-6784
HELDERBERG	6584-	7206-	7012-	6303-	7004-	6320-	6390-	6639-	6704-	6784-
KEYSER-BASS ISLANDS SALINA										
GUELPH - LOCKPORT BLACK WATER										
CLINTON IRONDEQUOIT										
MEDINA										
QUEENSTON										
TOTAL DEPTH	6675	7285	7105	6401	7078	6410	6490	6720	6800	6875
DEEPEST FORMATION REACHED	Helderberg	Helderberg	Helderberg	Helderberg	Helderberg	Helderberg	Helderberg	Helderberg	Helderberg	Helderberg
RESULT	2,034 Mcf Nat. 3,216 Mcf AF 3,560 psi/48 hrs. Gas Storage Leidy Pool	.475 Mcf Nat. 7.4 Mcf AF 380 psi/48 hrs. Gas Storage Tamarack Pool	8.9 Mcf AF 285 psi/48 hrs. Gas Storage Tamarack Pool	9,773 Mcf Nat. 23,938 Mcf AF 2,220 psi/48 hrs. Gas Storage Leidy Pool	10 Mcf AF 155 psi/48 hrs. Gas Storage Tamarack Pool	1,903 Mcf Nat. 3,062 Mcf AF 3,460 psi/48 hrs. Gas Storage Leidy	2,994 Mcf Nat. 4,845 Mcf AF 3,350 psi/48 hrs. Gas Storage Leidy	587 Mcf Nat. 719 Mcf AF 3,440 psi/48 hrs. Gas Storage Leidy	4.8 Mcf AF 2,550 psi/48 hrs. Gas Storage Greenlick Pool	830 Mcf Nat. 587 Mcf AF 2,280 psi/48 hrs. Gas Storage Greenlick

COUNTY Permit Number	Clinton 116	Clinton 124	Crawford 364	Crawford 379	Crawford 372	Crawford 369	Crawford 382	Crawford 386	Crawford 328	Crawford 356
NAME OF WELL	Pa. Dept. F & W Tract 17 #LW-712	Pa. Dept. F & W Tract 18 #LW-806	O. Bailey #1	K. E. Bailey #1	(R. W. Holler) W. C. Bailey #1	E. J. Oygert #1	R. Endress #1B	Floch-Roberts #1	A. Ford #1	(fmly L. Cooper) S. L. Marks #2
OPERATOR	Consol. Gas Supply Corp.	Consol. Gas Supply Corp.	James Drilling Co.	James Drilling Co.	James Drilling Co.	James Drilling Co.	James Drilling Co.	Russell McConnell	James Drilling Co.	James Drilling Co.
TOWNSHIP	Leidy	Leidy	Summerhill	Summerhill	Summerhill	Spring	Spring	South Shenango	Summerhill	Spring
QUADRANGLE	Renovo West B 218	Renovo West C 220	Linesville C 37	Girard I 418	Linesville B 40	Girard I 422	Girard I 423	Linesville G 39	Girard I 412	Girard I 421
LATITUDE	16,450 ft. S 41°30'	9,900 ft. S 41°30'	950 ft. S 41°45'	29,900 ft. S 41°50'	1,100 ft. S 41°45'	22,250 ft. S 41°50'	25,150 ft. S 41°50'	7,950 ft. S 41°35'	29,800 ft. S 41°50'	26,800 ft. S 41°50'
LONGITUDE	100 ft. W 77°50'	13,800 ft. W 77°45'	16,800 ft. W 80°15'	16,450 ft. W 80°15'	4,800 ft. W 80°20'	14,350 ft. W 80°15'	13,900 ft. W 80°15'	9,450 ft. W 80°35'	21,000 ft. W 80°15'	19,100 ft. W 80°15'
DATE COMPLETED	8-17-71	8-6-71	12-21-70	12-31-70	10-15-71	9-27-71	9-15-71	8-15-71	12-15-70	2-7-71
ELEVATION	1681	1739	1324 KB	1276 KB	1247 KB	1228 KB	1212 KB	1229 KB	1251 KB	1236 KB
TULLY	5620-	5571-								
ONONDAGA LIMESTONE / CHERT	6410-6425	6466-6479		2683-2852	2397-2590	2602-2794	2590-2778	2872-3086	2618-2838	2628-2830
ORISKANY	6425-6450	6479-6505		2852-2860	2590-2600	2794-2804	2778-2788	Absent	2838-2848	2830-2840
HELDERBERG	6450-	6505-						3086-3180		
KEYSER-BASS ISLANDS SALINA										
GUELPH-LOCKPORT BLACK WATER			3623-3790	3588-3740	3308-3500	3455-	3478-3750	3839-4070 4012	3520-3671	3520-3710
CLINTON IRONDEQUOIT			3950	3930	3646	3791	3817	4200	3860	3869
MEDINA			3994-	3961-	3680-	3823-	3850-	4237-	3892-	3902-
QUEENSTON			4182-	4150-	3865-	3990-	4034-	4437-	4043-	4086-
TOTAL DEPTH	6540	6595	4201	4191	3918	3993	4038	4440	4049	4156
DEEPEST FORMATION REACHED	Helderberg	Helderberg	Queenston	Queenston	Queenston	Queenston	Queenston	Queenston	Queenston	Queenston
RESULT	1,378 Mcf Nat. 1,438 Mcf AF 3,380 psi/48 hrs. Gas Storage Leidy Pool	1,378 Mcf Nat. 2,274 Mcf AF 3,110 psi/48 hrs. Gas Storage Leidy Pool	25 bo & 500 Mcf AF 1,150 psi/72 hrs. Indian Springs Pool	1,000 Mcf AF 1,170 psi/72 hrs. Indian Springs Pool	1,000 Mcf AF 1,170 psi/48 hrs. Indian Springs Pool	1,500 Mcf AF 1,175 psi/48 hrs. Indian Springs Pool	10 bo & 1,500 Mcf 1,165 psi/48 hrs. (AF) Indian Springs Pool	NSOG Abandoned Wildcat	1,000 Mcf AF 1,175 psi/72 hrs. Indian Springs Pool	25 bo & 500 Mcf AF 1,175 psi/72 hrs. Indian Springs Pool

Table 15. *(continued)*

MAP NUMBER								19	22	
COUNTY Permit Number	Crawford 378	Crawford 329	Erie 333	Erie 334	Erie 326	Erie 327	Erie 324	Forest 404-DD	Fulton 4	Indiana 1496
NAME OF WELL	(fmly E. Rice) J. H. Troyer #1	M. Youngs #1	J. & A. Blood #1	J. & M. Freeman #1	T. Goodwill #2-1711	H. Sponsler #1-1712	W. G. Ulan #1	A. W. Albaugh Fee #1	G. W. Mellott #1-1182	Clearfield Bituminous Coal #2
OPERATOR	James Drilling Co.	James Drilling Co.	J. Sterling McCluskey	J. Sterling McCluskey	Pennsylvania Gas Co.	Pennsylvania Gas Co.	Banner Oil & Gas Funds	Ray A. Albaugh	Consol. Gas Supply Corp.	Felmont Oil Co.
TOWNSHIP	Spring	Summerhill	Conneaut	Conneaut	Summit	Summit	Elk Creek	Hickory	Licking Creek	Pine
QUADRANGLE	Girard I 417	Linesville C 38	Girard D 419	Girard D 420	Erie I 115	Erie I 116	Girard F 415	Tidioute H 9	Needmore B 3	Barnesboro E 24
LATITUDE	24,450 ft. S 41°50'	2,400 ft. S 41°45'	100 ft. S 41°55'	200 ft. S 41°55'	11,700 ft. S 42°05'	13,300 ft. S 42°05'	20,900 ft. S 41°55'	12,050 ft. S 41°35'	16,350 ft. S 40°00'	17,700 ft. S 40°40'
LONGITUDE	12,150 ft. W 80°15'	21,100 ft. W 80°15'	15,150 ft. W 80°25'	13,600 ft. W 80°25'	17,650 ft. W 80°00'	16,500 ft. W 80°00'	22,350 ft. W 80°15'	17,250 ft. W 79°20'	3,700 ft. W 78°05'	14,700 ft. W 78°50'
DATE COMPLETED	2-20-71	12-27-70	5-15-71	5-8-71	12-14-70	11-12-70	2-20-71	8-15-70	8-10-71	12-30-71
ELEVATION	1221 KB	1295 KB	822 KB	878 KB	1250 DF	1265 DF	1139 KB	1552 DF	843 KB	1997 RT
TULLY			1497-1592	1538-1589	1885-1980	1910-2008	2110-	4288-4400		☆7328-7347
ONONDAGA LIMESTONE	2500-2770	2550-2860	1688-1985	1735-2022	2104-2345	2128-2373	2290-	4590-4620	2509-2671	☆8100-8117
ONONDAGA CHERT								4620-4700		☆8117-8217
ORISKANY	2770-2780	2860-2870	Absent	Absent	2345-2370	2373-2394		Absent	2671-2741	☆8217-8236
HELDERBERG					2370-	2394-		4700-	2741-	☆8236-
KEYSER-BASS ISLANDS SALINA							2890-(salt)			
GUELPH-LOCKPORT BLACK WATER	3476- 3660	3590- 3760	2587- 2747	2634- 2800			3140-			
CLINTON IRONDEQUOIT	3816	3935	2911	2965			3476			
MEDINA	3850-	3966-	2937-	2985-			3548-3586			
QUEENSTON		4150-	3118-	3167-			3685-			
TOTAL DEPTH	4004	4213	3161	3203	2417	2435	3717	4720	2870	☆8264
DEEPEST FORMATION REACHED	Cabot Head?	Queenston	Queenston	Queenston	Helderberg	Helderberg	Queenston	Helderberg	Helderberg	Helderberg
RESULT	1,500 Mcf AF 1,175 psi/48 hrs. Indian Springs Pool	1,000 Mcf AF 1,125 psi/72 hrs. Indian Springs Pool	1,000 Mcf AF 1,100 psi/48 hrs. Bushnell-Lexington Pool	2,500 Mcf AF 1,100 psi/48 hrs. Conneaut Pool	10,862 Mcf Nat. 775 psi/24 hrs. Gas Storage Meade (Summit)	3,117 Mcf Nat. 780 psi/48 hrs. Gas Storage Meade (Summit)	500 Mcf Nat. 1,100 Mcf AF 900 psi/3 days Lundys Lane Pool	NSOG Abandoned Wildcat	NSOG Abandoned Wildcat	685 Mcf Nat. 5,800 Mcf AF 4,275 psi/2 days Pineton Pool

COUNTY / Permit Number	Indiana 1589	Indiana 1458	Indiana 1563	McKean 7520-P	Potter 314	Potter 329	Potter 335	Potter 388	Potter 387	Potter 411
NAME OF WELL	Clearfield Bituminous Coal #3	A. H. Davis #1	B. R. Williams Estate #1	Kewanee Oil Co. Warrant 3703 #WC-1	Pa. Dept. F & W Tract 141 #B-1	Pa. Dept. F & W Tract 16 #14 #RW-44	Pa. Dept. F & W Tract 16 #15 #RW-58	Pa. Dept. F & W Tract 16 #LW-906	Pa. Dept. F & W Tract 16 #LW-907	Pa. Dept. F & W Tract 18 #LW-905
OPERATOR	Felmont Oil Co.	Felmont Oil Co.	Felmont Oil Co.	Pennzoil United, Inc.	Texaco, Inc.	Consol. Gas Supply Corp.	Consol. Gas Supply Corp.	Consol. Gas Supply Corp.	Consol. Gas Supply Corp.	Consol. Gas Supply Corp.
TOWNSHIP	Pine	Green	Pine	Corydon	Portage	Stewardson	Stewardson	Stewardson	Stewardson	Stewardson
QUADRANGLE	Barnesboro E 26	Barnesboro E 22	Barnesboro D 25	Kinzua A 16	Emporium H 23	Renovo East A 23	Renovo East A 20	Renovo West B 216	Renovo West C 215	Renovo West C 217
LATITUDE	19,900 ft. S 40°40'	9,150 ft. S 40°40'	24,050 ft. S 40°40'	4,750 ft. S 42°00'	1,600 ft. S 41°35'	5,000 ft. S 41°30'	700 ft. S 41°30'	700 ft. S 41°30'	900 ft. S 41°30'	6,950 ft. S 41°30'
LONGITUDE	2,510 ft. W 78°55'	4,700 ft. W 78°50'	6,210 ft. W 78°55'	100 ft. W 78°55'	13,450 ft. W 78°05'	14,000 ft. W 77°40'	11,300 ft. W 77°40'	3,750 ft. W 77°45'	1,375 ft. W 77°45'	11,750 ft. W 77°45'
DATE COMPLETED	8-17-71	9-24-70	6-25-71	5-9-71	8-29-69	2-10-71	1-19-71	8-17-71	8-4-71	8-10-71
ELEVATION	1633 RT	1963 KB	1935 KB	1483 KB	2407 KB	1733	1878	1799	1971	1743
TULLY	*7069-7091	*7267-7296	*7359-7375	*3304-3327	*5860-5925	5693-5787	5753-5845	5524-	5631-	5591-
ONONDAGA LIMESTONE	*7792-7806	*8327-8354	*8089-8104	*3626-3728	*6477-6495	6570-6594	6648-6677	6339-6356	6463-6481	6388-6404
ONONDAGA CHERT	*7806-7907	*8354-8840	*8104-8206							
ORISKANY	*7907-7922	*8840-8884	*8206-8221	Absent	*6495-6544	6594-6646	6677-6719	6356-6396	6481-6520	6404-6434
HELDERBERG	*7922-	*8884-	*8221-	*3728-3748	*6544-	6646-	6719-	6396-	6520-	6434-
KEYSER-BASS ISLANDS SALINA				*3812-						
GUELPH-LOCKPORT BLACK WATER				*4465-4730						
CLINTON IRONDEQUOIT				*4730-4844						
MEDINA				*4886-5050						
QUEENSTON				*5050-						
TOTAL DEPTH	*7931	*8901	*8239	5064	*6572	6740	6805	6475	6594	6517
DEEPEST FORMATION REACHED	Helderberg	Helderberg	Helderberg	Queenston	Helderberg	Helderberg	Helderberg	Helderberg	Helderberg	Helderberg
RESULT	7,300 Mcf Nat. 4,169 psi/96 hrs. Pineton Pool	114 Mcf AF 850 psi/55 hrs. Pineton Pool	28 Mcf Nat. 14,200 Mcf AF 4,230 psi/16 hrs. Pineton Pool	NSOG Abandoned Wildcat	NSOG Abandoned Wildcat	3,981 Mcf Nat. 13,820 Mcf AF 2,625 psi/48 hrs. Gas Storage Greenlick Pool	424 Mcf Nat. 5,523 Mcf AF 2,860 psi/48 hrs. Gas Storage Greenlick Pool	1,313 Mcf AF 2,970 psi/48 hrs. Gas Storage Leidy Pool	1,313 Mcf Nat. 4,845 Mcf AF 3,225 psi/48 hrs. Gas Storage Leidy Pool	4,597 Mcf Nat. 10,393 Mcf AF 3,202 psi/48 hrs. Gas Storage Leidy Pool

Table 15. *(continued)*

MAP NUMBER										
COUNTY Permit Number	Potter 331	Potter 332	Potter 370	Potter 383	Potter 362	Potter 384	Potter 366	Potter 356	Potter 361	Somerset 39
NAME OF WELL	Pa. Dept. F & W Tract 45 #6 #RW-56	Pa. Dept. F & W Tract 45 #7 #RW-57	Pa. Dept. F & W Tract 45 #9 #RW-500	Pa. Dept. F & W Tract 58 #4 #RW-66	Pa. Dept. F & W Tract 58 #5 #RW-74	Pa. Dept. F & W Tract 67 #3 #RW-75	V. M. Richardson #1 #EW-323	J. I. Smoker #1 #EW-218	West Virginia Pulp & Paper #2 #EW-110	R. Tressler #1-4849
OPERATOR	Consol. Gas Supply Corp.	Consol. Gas Supply Corp.	Consol. Gas Supply Corp.	Consol. Gas Supply Corp.	Consol. Gas Supply Corp.	Consol. Gas Supply Corp.	Consol. Gas Supply Corp.	Consol. Gas Supply Corp.	Consol. Gas	Columbia Gas of Pa. (fmly Mfrs. Light & Heat)
TOWNSHIP	Stewardson	Stewardson	Stewardson	Stewardson	Stewardson	Stewardson	Genesee	Allegany	Genesee	Elk Lick
QUADRANGLE	Renovo East A 22	Renovo East A 21	Galeton G 50	Galeton G 49	Galeton G 47	Galeton G 48	Genesee B 181	Genesee D 183	Genesee D 182	Grantsville A 2
LATITUDE	2,400 ft. S 41°30'	3,300 ft. S 41°30'	30,300 ft. S 41°35'	25,650 ft. S 41°35'	23,300 ft. S 41°35'	21,800 ft. S 41°35'	29,100 ft. S 42°00'	2,200 ft. S 41°55'	7,150 ft. S 41°55'	8,375 ft. S 39°45'
LONGITUDE	10,700 ft. W 77°40'	12,350 ft. W 77°40'	7,700 ft. W 79°40'	3,150 ft. W 77°40'	2,900 ft. W 77°40'	400 ft. W 77°40'	17,175 ft. W 77°50'	3,900 ft. W 77°55'	7,200 ft. W 77°55'	8,325 ft. W 79°10'
DATE COMPLETED	1-25-71	2-2-71	3-3-71	6-4-71	4-15-71	7-23-71	12-11-70	12-30-70	12-8-70	11-12-71
ELEVATION	1920	1969	1823	1991	1854	1941	1935	2220	2251	2915 KB
TULLY	5848-5938	5890-5978	5707-	5850-	5716-	75848-	4347-4394	4706-4753	4732-4778	7532-
ONONDAGA LIMESTONE	6697-6723	6725-6752	6546-6571	6697-6722	6627-6648	6714-6734	4961-4986	5308-5323	5331-5349	8346-8374
ONONDAGA CHERT										8374-8482
ORISKANY	6723-6762	6752-6790	6571-6609	6722-6762	6648-6688	6734-6770	4986-5017	5323-5353	5349-5378	8482-8620
HELDERBERG	6762-	6790-	6609-	6762-	6688-	6770-	5017-	5353-	5378-	8620-
KEYSER-BASS ISLANDS SALINA										
GUELPH-LOCKPORT BLACK WATER										
CLINTON IRONDEQUOIT										
MEDINA										
QUEENSTON										
TOTAL DEPTH	6880	6880	6800	6851	6784	6870	5080	5434	5448	8636
DEEPEST FORMATION REACHED	Helderberg	Helderberg	Helderberg	Helderberg	Helderberg	Helderberg	Helderberg	Helderberg	Helderberg	Helderberg
RESULT	5,713 Mcf Nat. 15,452 Mcf AF 2,945 psi/48 hrs.	29,469 Mcf Nat. 33,975 Mcf AF 2,745 psi/48 hrs.	5,305 Mcf Nat. 7,350 Mcf AF 2,850 psi/48 hrs.	4,332 Mcf AF 2,465 psi/48 hrs. Gas Storage	19,545 Mcf Nat. 46,592 Mcf AF ,585 psi/48 hrs.	2,349 Mcf Nat. 15,452 Mcf AF 3,655 psi/48 hrs.	23,429 Mcf Nat. 22,921 Mcf AF 1,958 psi/72 hrs.	5,305 Mcf Nat. 32,624 Mcf AF 1,835 psi/48 hrs.	38,481 Mcf Nat. 1,952 psi/72 hrs. Gas Storage	133 Mcf Nat. 2,400 Mcf AF 2,835 psi/7 days

MAP NUMBER	16
COUNTY Permit Number	Warren 2602
NAME OF WELL	D-Y-M Corp. #1
OPERATOR	Meridian Exploration
TOWNSHIP	Limestone
QUADRANGLE	Tidioute F 8
LATITUDE	4,850 ft. S 41°40'
LONGITUOE	21,100 ft. W 79°15'
OATE COMPLETEO	9-11-70
ELEVATION	1320 OF
TULLY	3838-3888
ONONOAGA LIMESTONE	4137-4157
ONONOAGA CHERT	4157-4206
ORISKANY	Absent
HELDERBERG	4206-4260
KEYSER-BASS ISLANOS SALINA	4260-
GUELPH-LOCKPORT BLACK WATER	
CLINTON IRONOEQUOIT	
MEOINA	
QUEENSTON	
TOTAL OEPTH	4275
OEEPEST FORMATION REACHEO	Bass Islands
RESULT	NSOG in Lower Devonian Abandoned Camp Run Extension